would be required were more frequencies available and thus resulting in lower scale-based amortization of fixed cell site costs.

1) Frequency Assignments Impact on Network Capacity

Most industry analysts expect the market for cellular services to reach 16-20% penetration of population in ten year's time. (For comparison, over the first 9 years of service in major markets, cellular penetration has reached 4-6%, varying by market.) This market will be shared by the two incumbent cellular players, any new entrants due to PCS licensing, and SMR operators. On the assumption that PCS is not a factor, and that there are no more than two SMR operators in each market, then equal shares among the players would lead to a penetration of 4-5% each. This view is confirmed by Merrill Lynch in their valuation of Nextel (the leading SMR operator) which projects a Nextel penetration of 4% in 2003.

We calculated network capacity at various channel assignments using the model described above, based on the parameters in Table 1. The maximum number of Radios per cell site (Max Radios/Cell) is an important technical characteristic of the MIRS system. This limit is at least 12 (4 per Sector) although we believe that the system capabilities will ultimately allow 30 per cell.

Table 1: Network Parameters for Capacity Test

Sectoring	3 Sectors per Cell	Standard sectorization
Re-use	9 (7 cell pattern, degraded)	Typical engineering assumption
Max Radios/Cell	12 (4 per Sector)	Minimum MIRS equipment capability
Max Cells	240	Assumption based on Cellular operators existing build and plans in Atlanta and other Metros
Efficiency	65%	Typical number used in Cellular Network Engineering approximations
Usage	1 BHCCS/Sub	High end of today's cellular customer usage

As shown in Figure 2, 80 frequencies would be sufficient to serve at least 183,000 or 5% penetration of population[1] even at a limit of 12 radios per cell. (Note that with a maximum of 12 radios per cell, there is no utility in more than 120 frequencies.)

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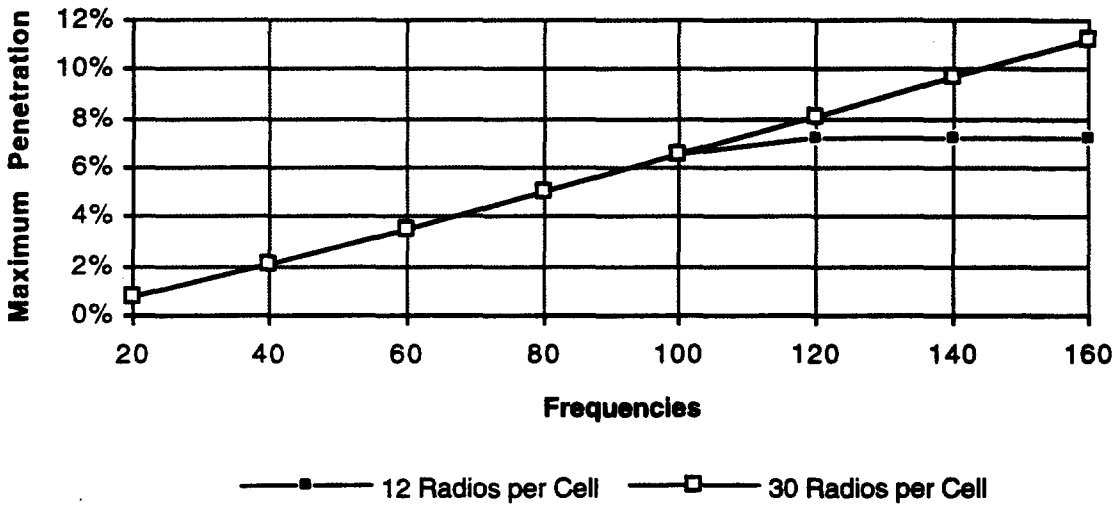
[1] *2003 population estimated at 3,641,326. Source: 1992 MSA population "Cellular Communications Industry", Donaldson, Lufkin, and Jennerette; Growth rate: Rand McNally Commercial Atlas and Marketing Guide.*

Therefore an SMR operator requires a minimum of 80 channels to have sufficient capacity to compete in the market for cellular telephony. In a different market, the minimum channel requirement would depend on the usage profile and the size of the potential subscriber base, so would likely be different.

Figure 2: Capacity of the Network



2) Frequency Assignment Impact on Network Capital Scale Economics

This analysis depends on network equipment cost assumptions. MIRS equipment cost data is estimated from available information on digital cellular equipment, primarily EMCI data modeling TDMA6 (Table 2).

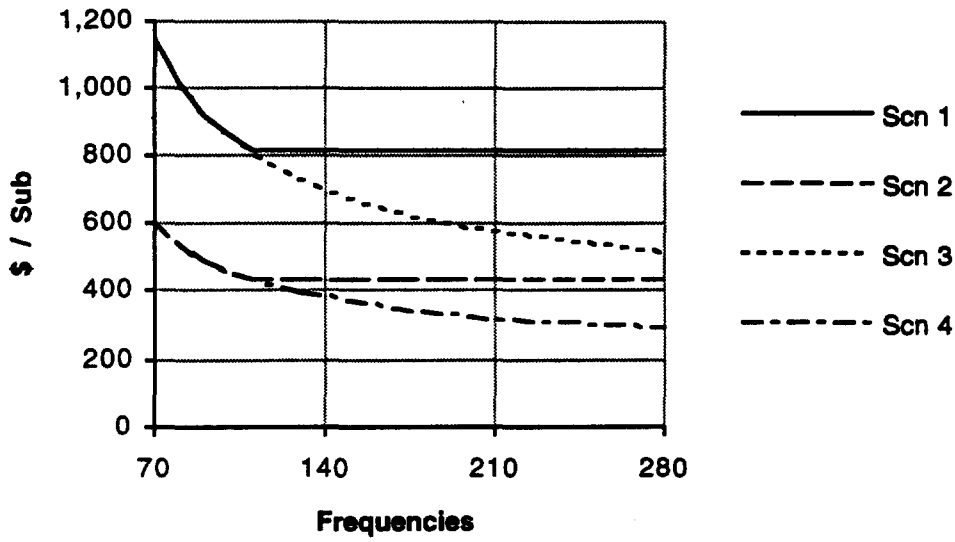
Table 2: Estimated MIRS Equipment Costs

Cell Sites, including real estate, tower construction, electronics shelters, and HVAC	$400,000
Base Station Controller (1 per 12 radios in a fully Sectored network)	$100,000
Radios	$15,000
Voice Channels	$800
Switching & Intelligent Network	$9,500,000
Backhaul, transport	10% of cell site costs

Total capital costs were calculated by summing the total costs for cell sites, switching, network, replenishment, and transport. Costs per subscriber were

determined by dividing the total capital expenditures by the total number of subscribers supported by the system (Figure 3) under a range of scenarios (Table 3).

Figure 3: Cost per Sub at 4% Penetration vs Channels



Thus, in two Scenarios (1 and 2), additional frequencies beyond 120 have no impact on cost, because the cells are limited to 12 radios each. In Scenario 3 (High Usage) there is a $100/sub advantage at 210 vs 140 frequencies. In Scenario 4 (Low Usage), there is a $80/sub advantage at 210 vs 140 frequencies.

Table 3: Scale Curve Scenarios

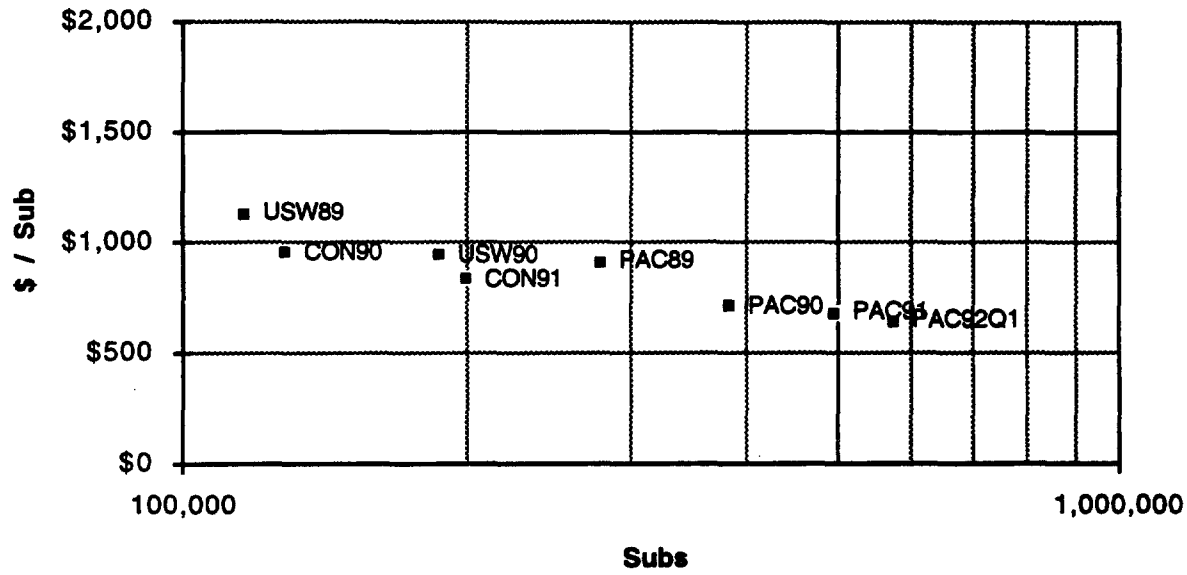
SCENARIO	RADIOS/CELL	USAGE (BHCCS)
1	12	1 0
2	12	0.5
3	30	1.0
4	30	0.5

Impact of Network Scale Economies on Competitiveness

Any effect that frequency assignment has on SMR economics must be considered in the context of overall operating costs. Operations costs vary significantly among operators and are strongly scale-driven (by total number of subscribers, not subscribers in any single city), as can be observed among today's cellular operators. Data for U S WEST New Vector Group (USW), PacTel Cellular (PAC) and Contel Cellular (CON)

show operations costs between $600 and $1000 per sub per year (Figure 4). So a capital cost disadvantage of $100, considered in terms of an annual depreciation charge of, say $20, has only a 2-3% impact on costs.

Figure 4: Total Operations Cost/Subscriber

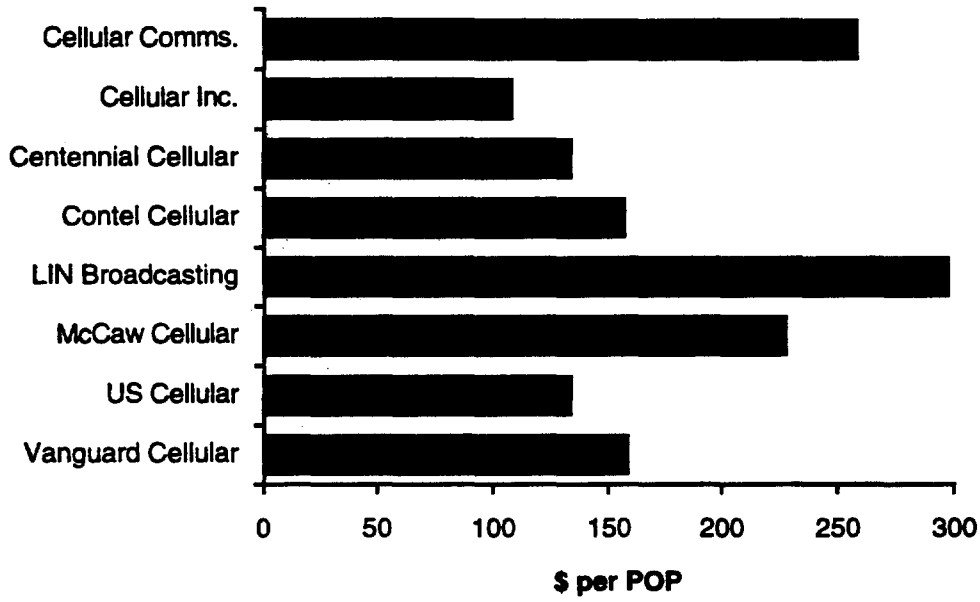


An alternative method to evaluate the impact of frequency on scale economics is to examine the difference between discounted cash flows in different frequency scenarios. For the purposes of this DCF analysis, we have assumed a 10-year roll out, during which the 4% ultimate penetration is achieved through steady growth of 0.4% per year. Assets are replaced at cost after 5 years, annual investment is assumed constant once 4% penetration is reached. No effects of tax have been incorporated. Cash flows have been discounted at 15% per annum, consistent with the risk of the venture.

Table 4: Difference in Business Value due to Frequency Assignment

SCENARIO	MAX RADIOS/CELL	CUSTOMER USAGE (BHCCS)	VALUE/POP DIFFERENCE
1	12	1 0	$0
2	12	0.5	$0
3	30	1.0	$4.74
4	30	0.5	$2.12

Figure 5: Current Cellular Valuations[1]



The difference between 140 and 210 radio channels under the four scenarios, is shown in Table 4. These valuation differences are very small in comparison with the expected value of the business. Nextel is currently valued at \$50/POP[2] based on a \$40 per share stock price, and at \$62/POP by Merrill Lynch. Cellular players are valued at \$100-\$300/POP (Figure 5). This wide variation is caused by differences in geographical attractiveness, competitive environment, management performance, among other factors. In this context, a difference in value of less than 10% is negligible.

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[1] *Source: "SMR in the United States: A Window of Opportunity", October 1993, Merrill Lynch*

[2] *POP: Population of areas in which Nextel controls SMR Spectrum*

BOOZ•ALLEN
BIOGRAPHIES

MARTIN G. HYMAN

Mr. Hyman is a vice president and partner in the Communications, Computing, and Electronics practice of Booz•Allen & Hamilton Inc. His background includes a wide range of marketing, business development, strategic planning, and engineering experience within the telecommunications industry over a twenty year period. Specific areas of focus are:

- Market strategy development for telecommunications product and service providers
- Cost benchmarking and restructuring for telecommunications product and service providers
- Business strategy assessment for wireless operators
- Market, product and competitive strategy for multimedia businesses

Mr. Hyman has been involved in major new product evaluations and market strategy assessments for telecommunications service providers ranging across:

- Interactive TV
- Consumer databases
- Voice processing
- International communications
- Long distance
- Distance learning

In addition, he has led multiple competitive cost benchmarking and restructuring assignments:

- Information systems restructuring
- Network expense and capital cost reduction
- Capital budgeting process re-engineering
- Wireless operating expense and capital expenditures

In the multimedia arena representative projects include:

- Broadband access product/market assessment
- Videophone product strategy
- Electronic meeting applications assessment

His business strategy projects in wireless include:

- PCS strategy development
- Wireless business valuation modeling
- ESMRs market entry
- Acquisition analyses

Prior to joining the firm, Mr. Hyman worked as Vice President-Business Development and Planning for US Sprint with responsibility for development of its five year strategic plan and management of its corporate acquisition/strategic alliance programs.

Mr. Hyman's accomplishments with GTE included joint venture relationship with Siemens AG. and a joint venture relationship with United Telecom (SPRINT).

Previously, Mr. Hyman directed the marketing organization for GTE's satellite communications subsidiary and managed ATT's market research and forecasting function for its data services.

Engineering background includes product development for GTE and engineering research for Western Electric.

Mr. Hyman is a frequent industry spokesperson at conferences and in the press.

Mr. Hyman's consulting assignments and experience includes testimony in various regulatory and legal forums including DOJ proceedings, tax courts, and litigation support.

Mr. Hyman holds an MS in Operations Research from the Stanford School of Engineering and a BS in Operations Research from the Columbia School of Engineering.

RAUL L. KATZ

Raul L. Katz is a principal with Booz, Allen & Hamilton's Communications, Computing and Electronics Practice, specializing in business strategy, consumer and industrial marketing and the management of telecommunication companies.

Dr. Katz has works extensively in the assessment of domestic and international markets for telecommunication services and equipment. His clients have included U.S. based local exchange and long distance carriers as well as value-added networks and multi-national telecommunication equipment and computer manufacturers. He manages projects in the areas of demand forecasting, competitive analysis, market entry strategy, and new product development for offerings such as voice processing equipment, general purpose computing, workstations, applications software, information services, interactive-television, electronic data interchange, and value-added networks. Dr. Katz conducts assignments in the United States, various European countries, Japan, and Latin America.

In the context of his expertise in telecommunications marketing, Dr. Katz has managed numerous projects in the area of services and products supplied to the Financial Services industry. He managed vertical market strategies in the U.S. and European banking sectors, as well as studies in trading room turrets, financial EDI, and broadband services to the banking industry.

Dr. Katz joined Booz, Allen after serving as a second vice-president for Chase Manhattan Bank's International Operations and Systems Group. His responsibilities included developing informations systems plans for several overseas subsidiaries, including France, Chile, and Canada. He was also involved in assessing the impact of transborder data flow regulations on the Bank's operations. Prior to joining Chase he worked as a consultant for international organizations, foreign governments and supplier firms in the telecommunications, computer and entertainment industries in France, Argentina, and Brazil.

Dr. Katz received his Ph.D. in Management Science and Political Science and an MS in Communications Technology and Policy from the Massachusetts Institute of Technology. In addition, he holds a Licence in History and a Maîtrise in Political Science from the University of Paris-Sorbonne, as well as a Licence and a Maîtrise (with honors) in Communication Sciences from the University of Paris.

Dr. Katz has published articles in journals such as Telecommunications Policy, and The Information Society. His book The Information Society: an International Perspective, focussing on the deregulation trends in the worldwide telecommunications industry, was published in 1988. His doctoral dissertation was awarded the 1986 K. Kyoon Hur Memorial Dissertation Award from the International Communications Association. He has lectured on several topics, including deregulation and privatization of international telecommunications, information systems planning, the economic impact of information systems, and the use of decision support systems. He is fluent in English, French and Spanish and has lived in France, in addition to his native country of Argentina.